

SEQUENCE LISTING

<110> Raju, Jeyaseelan

<120> NOVEL CARK PROTEIN AND NUCLEIC ACID MOLECULES AND USES  
THEREFOR

<130> MNI-068CP2

<140> US 09/947,199

<141> 2001-09-05

<150> US 60/111,938

<151> 1998-12-11

<150> US 09/291,839

<151> 1999-04-14

<150> US 09/458,457

<151> 1999-12-10

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<170> PatentIn Ver. 2.0

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Tyr Lys Ser Arg Pro Thr Gln Thr Cys Thr Asp Glu Trp Lys Lys Lys
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Val Ser Glu Ser Tyr Val Ile Thr Ile Glu Arg Leu Glu Asp Asp Leu
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| Leu | Ser | Leu | Leu | His | Leu | Cys | Cys | Ile | Cys | Gly | Gly | Lys | Lys | Ser | His |     |
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| 100 |     |     |     |     | 105 |     |     |     |     | 110 |     |     |     |     | 115 |     |
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| Leu | Ile | Thr | Ser | Leu | Leu | His | Ser | Gly | Ala | Asp | Ile | Gln | Gln | Val | Gly |     |
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| Tyr | Gly | Gly | Leu | Thr | Ala | Leu | His | Ile | Ala | Thr | Ile | Ala | Gly | His | Leu |     |
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| Glu | Ala | Ala | Asp | Val | Leu | Leu | Gln | His | Gly | Ala | Asn | Val | Asn | Ile | Gln |     |
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| Asp | Ala | Val | Phe | Phe | Thr | Pro | Leu | His | Ile | Ala | Ala | Tyr | Tyr | Gly | His |     |
|     | 165 |     |     |     |     | 170 |     |     |     |     | 175 |     |     |     |     |     |
| gaa | cag | gta | act | cgc | ctt | ctt | ttg | aaa | ttt | ggg | gct | gat | gta | aat | gta | 632 |
| Glu | Gln | Val | Thr | Arg | Leu | Leu | Leu | Lys | Phe | Gly | Ala | Asp | Val | Asn | Val |     |
| 180 |     |     |     |     | 185 |     |     |     |     | 190 |     |     |     |     | 195 |     |
| agt | ggg | gaa | gtt | gga | gat | aga | ccc | ctc | cac | cta | gca | tct | gca | aaa | gga | 680 |
| Ser | Gly | Glu | Val | Gly | Asp | Arg | Pro | Leu | His | Leu | Ala | Ser | Ala | Lys | Gly |     |
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| ttc | ttg | aat | att | gca | aaa | ctc | ttg | atg | gaa | gaa | ggc | agc | aaa | gca | gat | 728 |
| Phe | Leu | Asn | Ile | Ala | Lys | Leu | Leu | Met | Glu | Glu | Gly | Ser | Lys | Ala | Asp |     |
|     |     | 215 |     |     |     |     |     | 220 |     |     |     |     | 225 |     |     |     |
| gtg | aat | gct | caa | gat | aat | gaa | gac | cat | gtc | cca | ctc | cat | ttc | tgt | tct | 776 |
| Val | Asn | Ala | Gln | Asp | Asn | Glu | Asp | His | Val | Pro | Leu | His | Phe | Cys | Ser |     |
|     | 230 |     |     |     |     | 235 |     |     |     |     |     | 240 |     |     |     |     |
| cga | ttt | gga | cac | cat | gat | ata | gtt | aag | tat | ctg | ctg | caa | agt | gat | ttg | 824 |
| Arg | Phe | Gly | His | His | Asp | Ile | Val | Lys | Tyr | Leu | Leu | Gln | Ser | Asp | Leu |     |
|     | 245 |     |     |     |     | 250 |     |     |     |     | 255 |     |     |     |     |     |
| gaa | gtt | caa | cct | cat | gtt | gtt | aat | atc | tat | gga | gat | acc | ccc | tta | cac | 872 |
| Glu | Val | Gln | Pro | His | Val | Val | Asn | Ile | Tyr | Gly | Asp | Thr | Pro | Leu | His |     |
| 260 |     |     |     |     | 265 |     |     |     |     | 270 |     |     |     |     | 275 |     |
| ctg | gca | tgc | tac | aat | ggc | aaa | ttt | gaa | gtt | gcc | aag | gaa | atc | atc | caa | 920 |
| Leu | Ala | Cys | Tyr | Asn | Gly | Lys | Phe | Glu | Val | Ala | Lys | Glu | Ile | Ile | Gln |     |
|     |     |     | 280 |     |     |     |     | 285 |     |     |     |     | 290 |     |     |     |
| ata | tca | gga | aca | gaa | agt | ctg | act | aag | gaa | aac | atc | ttc | agt | gaa | aca | 968 |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |      |  |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|--|
| Ile | Ser | Gly | Thr | Glu | Ser | Leu | Thr | Lys | Glu | Asn | Ile | Phe | Ser | Glu | Thr |      |  |
|     |     |     | 295 |     |     |     |     | 300 |     |     |     |     | 305 |     |     |      |  |
| gct | ttt | cat | agt | gct | tgt | acc | tat | ggc | aag | agc | att | gac | cta | gtc | aaa | 1016 |  |
| Ala | Phe | His | Ser | Ala | Cys | Thr | Tyr | Gly | Lys | Ser | Ile | Asp | Leu | Val | Lys |      |  |
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| ttt | ctt | ctt | gat | cag | aat | gtc | ata | aac | atc | aac | cac | caa | gga | agg | gat | 1064 |  |
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| Gly | His | Thr | Gly | Leu | His | Ser | Ala | Cys | Tyr | His | Gly | His | Ile | Arg | Leu |      |  |
| 340 |     |     |     |     | 345 |     |     |     |     | 350 |     |     |     |     | 355 |      |  |
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| Val | Gln | Phe | Leu | Leu | Asp | Asn | Gly | Ala | Asp | Met | Asn | Leu | Val | Ala | Cys |      |  |
|     |     |     |     | 360 |     |     |     |     | 365 |     |     |     |     | 370 |     |      |  |
| gat | ccc | agc | agg | tct | agt | ggg | gaa | aaa | gat | gag | cag | aca | tgt | ttg | atg | 1208 |  |
| Asp | Pro | Ser | Arg | Ser | Ser | Gly | Glu | Lys | Asp | Glu | Gln | Thr | Cys | Leu | Met |      |  |
|     |     |     | 375 |     |     |     |     | 380 |     |     |     |     | 385 |     |     |      |  |
| tgg | gct | tat | gaa | aaa | ggg | cat | gat | gcc | att | gtc | aca | ctc | ctg | aag | cat | 1256 |  |
| Trp | Ala | Tyr | Glu | Lys | Gly | His | Asp | Ala | Ile | Val | Thr | Leu | Leu | Lys | His |      |  |
|     |     | 390 |     |     |     |     | 395 |     |     |     |     | 400 |     |     |     |      |  |
| tat | aag | aga | cca | caa | gat | gaa | ttg | ccc | tgt | aat | gaa | tat | tct | cag | cct | 1304 |  |
| Tyr | Lys | Arg | Pro | Gln | Asp | Glu | Leu | Pro | Cys | Asn | Glu | Tyr | Ser | Gln | Pro |      |  |
|     |     | 405 |     |     |     | 410 |     |     |     |     |     | 415 |     |     |     |      |  |
| gga | gga | gat | ggc | tcc | tat | gtg | tct | gtt | cca | tca | ccc | ttg | ggg | aag | att | 1352 |  |
| Gly | Gly | Asp | Gly | Ser | Tyr | Val | Ser | Val | Pro | Ser | Pro | Leu | Gly | Lys | Ile |      |  |
| 420 |     |     |     |     | 425 |     |     |     |     | 430 |     |     |     |     | 435 |      |  |
| aaa | agc | atg | aca | aaa | gag | aag | gca | gat | att | ctc | ctc | cta | aga | gct | gga | 1400 |  |
| Lys | Ser | Met | Thr | Lys | Glu | Lys | Ala | Asp | Ile | Leu | Leu | Leu | Arg | Ala | Gly |      |  |
|     |     |     |     | 440 |     |     |     |     | 445 |     |     |     |     | 450 |     |      |  |
| ttg | cct | tca | cat | ttc | cat | ctt | cag | ctc | tca | gaa | att | gag | ttc | cat | gag | 1448 |  |
| Leu | Pro | Ser | His | Phe | His | Leu | Gln | Leu | Ser | Glu | Ile | Glu | Phe | His | Glu |      |  |
|     |     |     | 455 |     |     |     |     | 460 |     |     |     |     | 465 |     |     |      |  |
| att | att | ggc | tca | ggg | tct | ttt | ggg | aaa | gta | tat | aaa | gga | cga | tgc | aga | 1496 |  |
| Ile | Ile | Gly | Ser | Gly | Ser | Phe | Gly | Lys | Val | Tyr | Lys | Gly | Arg | Cys | Arg |      |  |
|     |     | 470 |     |     |     |     | 475 |     |     |     |     | 480 |     |     |     |      |  |
| aat | aaa | ata | gtg | gct | ata | aaa | cgt | tat | cga | gcc | aat | acc | tac | tgc | tcc | 1544 |  |
| Asn | Lys | Ile | Val | Ala | Ile | Lys | Arg | Tyr | Arg | Ala | Asn | Thr | Tyr | Cys | Ser |      |  |
|     |     | 485 |     |     |     | 490 |     |     |     |     | 495 |     |     |     |     |      |  |
| aag | tca | gat | gtg | gat | atg | ttt | tgc | cga | gag | gtg | tcc | att | ctc | tgc | cag | 1592 |  |
| Lys | Ser | Asp | Val | Asp | Met | Phe | Cys | Arg | Glu | Val | Ser | Ile | Leu | Cys | Gln |      |  |
| 500 |     |     |     |     | 505 |     |     |     |     | 510 |     |     |     |     | 515 |      |  |
| ctc | aat | cat | ccc | tgc | gta | att | cag | ttt | gtg | ggg | gct | tgc | ttg | aat | gat | 1640 |  |

|   |      |
|---|------|
| Leu Asn His Pro Cys Val Ile Gln Phe Val Gly Ala Cys Leu Asn Asp |      |
| 520 525 530   |      |
| ccc agc cag ttt gcc att gtc act caa tac ata tca ggg ggt tct ctg | 1688 |
| Pro Ser Gln Phe Ala Ile Val Thr Gln Tyr Ile Ser Gly Gly Ser Leu |      |
| 535 540 545   |      |
| ttc tcc ctc ctt cat gag cag aag agg att ctt gat ttg cag tct aaa | 1736 |
| Phe Ser Leu Leu His Glu Gln Lys Arg Ile Leu Asp Leu Gln Ser Lys |      |
| 550 555 560   |      |
| tta att att gca gta gat gtt gcc aaa ggc atg gag tac ctt cac aac | 1784 |
| Leu Ile Ile Ala Val Asp Val Ala Lys Gly Met Glu Tyr Leu His Asn |      |
| 565 570 575   |      |
| ctg aca cag cca att ata cat cgt gac ttg aac agt cac aat att ctt | 1832 |
| Leu Thr Gln Pro Ile Ile His Arg Asp Leu Asn Ser His Asn Ile Leu |      |
| 580 585 590 595   |      |
| ctc tat gag gat ggg cat gct gtg gtg gca gat ttt gga gaa tca aga | 1880 |
| Leu Tyr Glu Asp Gly His Ala Val Val Ala Asp Phe Gly Glu Ser Arg |      |
| 600 605 610   |      |
| ttt cta cag tct ctg gat gaa gac aac atg aca aaa caa cct ggg aac | 1928 |
| Phe Leu Gln Ser Leu Asp Glu Asp Asn Met Thr Lys Gln Pro Gly Asn |      |
| 615 620 625   |      |
| ctc cgt tgg atg gct cct gag gtg ttc acg cag tgc act cgg tac acc | 1976 |
| Leu Arg Trp Met Ala Pro Glu Val Phe Thr Gln Cys Thr Arg Tyr Thr |      |
| 630 635 640   |      |
| atc aaa gca gat gtc ttc agc tat gct ctg tgt ctg tgg gaa att ctc | 2024 |
| Ile Lys Ala Asp Val Phe Ser Tyr Ala Leu Cys Leu Trp Glu Ile Leu |      |
| 645 650 655   |      |
| act ggc gaa att cca ttc gct cat ctc aag cca gcg gct gcg gca gca | 2072 |
| Thr Gly Glu Ile Pro Phe Ala His Leu Lys Pro Ala Ala Ala Ala Ala |      |
| 660 665 670 675   |      |
| gac atg gct tac cac cac atc aga cct ccc att ggc tat tcc att ccc | 2120 |
| Asp Met Ala Tyr His His Ile Arg Pro Pro Ile Gly Tyr Ser Ile Pro |      |
| 680 685 690   |      |
| aag ccc ata tca tct ctg ctg ata cga ggg tgg aac gca tgt cct gaa | 2168 |
| Lys Pro Ile Ser Ser Leu Leu Ile Arg Gly Trp Asn Ala Cys Pro Glu |      |
| 695 700 705   |      |
| gga aga ccc gaa ttt tct gaa gtt gtc atg aag tta gaa gag tgt ctc | 2216 |
| Gly Arg Pro Glu Phe Ser Glu Val Val Met Lys Leu Glu Glu Cys Leu |      |
| 710 715 720   |      |
| tgc aac att gag ctg atg tct cct gca tca agt aac agc agt ggg tct | 2264 |
| Cys Asn Ile Glu Leu Met Ser Pro Ala Ser Ser Asn Ser Ser Gly Ser |      |
| 725 730 735   |      |
| ctc tca cct tct tct tct tct gat tgc ctg gtg aac cgg gga gga cct | 2312 |

Leu Ser Pro Ser Ser Ser Ser Asp Cys Leu Val Asn Arg Gly Gly Pro  
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 Tyr Ser Ser Gln Gly Leu Ser Leu Glu Glu Met Lys Arg Ser Leu Gln  
 790 795 800

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atg cat ttt cat tct tgc cga aat agt agc agc ttt gag gac agc agc 2552  
 Met His Phe His Ser Cys Arg Asn Ser Ser Ser Phe Glu Asp Ser Ser  
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Phe Gly Ser Asp Glu Ala Phe Ser Lys Val Asn Leu Asn Tyr Arg Thr

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| Glu | Asn | Gly | Leu | Ser | Leu | Leu | His | Leu | Cys | Cys | Ile | Cys | Gly | Gly | Lys |
| 65  |     |     |     |     | 70  |     |     |     |     | 75  |     |     |     |     | 80  |
| Lys | Ser | His | Ile | Arg | Thr | Leu | Met | Leu | Lys | Gly | Leu | Arg | Pro | Ser | Arg |
|     |     |     |     | 85  |     |     |     |     | 90  |     |     |     |     | 95  |     |
| Leu | Thr | Arg | Asn | Gly | Phe | Thr | Ala | Leu | His | Leu | Ala | Val | Tyr | Lys | Asp |
|     |     |     | 100 |     |     |     |     | 105 |     |     |     |     | 110 |     |     |
| Asn | Ala | Glu | Leu | Ile | Thr | Ser | Leu | Leu | His | Ser | Gly | Ala | Asp | Ile | Gln |
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| Gln | Val | Gly | Tyr | Gly | Gly | Leu | Thr | Ala | Leu | His | Ile | Ala | Thr | Ile | Ala |
|     |     | 130 |     |     |     | 135 |     |     |     |     | 140 |     |     |     |     |
| Gly | His | Leu | Glu | Ala | Ala | Asp | Val | Leu | Leu | Gln | His | Gly | Ala | Asn | Val |
| 145 |     |     |     |     | 150 |     |     |     |     | 155 |     |     |     |     | 160 |
| Asn | Ile | Gln | Asp | Ala | Val | Phe | Phe | Thr | Pro | Leu | His | Ile | Ala | Ala | Tyr |
|     |     |     | 165 |     |     |     |     |     | 170 |     |     |     |     | 175 |     |
| Tyr | Gly | His | Glu | Gln | Val | Thr | Arg | Leu | Leu | Leu | Lys | Phe | Gly | Ala | Asp |
|     |     |     | 180 |     |     |     |     | 185 |     |     |     |     | 190 |     |     |
| Val | Asn | Val | Ser | Gly | Glu | Val | Gly | Asp | Arg | Pro | Leu | His | Leu | Ala | Ser |
|     |     | 195 |     |     |     |     | 200 |     |     |     |     | 205 |     |     |     |
| Ala | Lys | Gly | Phe | Leu | Asn | Ile | Ala | Lys | Leu | Leu | Met | Glu | Glu | Gly | Ser |
|     |     | 210 |     |     |     | 215 |     |     |     |     | 220 |     |     |     |     |
| Lys | Ala | Asp | Val | Asn | Ala | Gln | Asp | Asn | Glu | Asp | His | Val | Pro | Leu | His |
| 225 |     |     |     |     | 230 |     |     |     |     | 235 |     |     |     |     | 240 |
| Phe | Cys | Ser | Arg | Phe | Gly | His | His | Asp | Ile | Val | Lys | Tyr | Leu | Leu | Gln |
|     |     |     |     | 245 |     |     |     |     | 250 |     |     |     |     | 255 |     |
| Ser | Asp | Leu | Glu | Val | Gln | Pro | His | Val | Val | Asn | Ile | Tyr | Gly | Asp | Thr |
|     |     |     | 260 |     |     |     |     | 265 |     |     |     |     | 270 |     |     |
| Pro | Leu | His | Leu | Ala | Cys | Tyr | Asn | Gly | Lys | Phe | Glu | Val | Ala | Lys | Glu |
|     |     |     | 275 |     |     |     | 280 |     |     |     |     | 285 |     |     |     |
| Ile | Ile | Gln | Ile | Ser | Gly | Thr | Glu | Ser | Leu | Thr | Lys | Glu | Asn | Ile | Phe |
|     |     | 290 |     |     |     | 295 |     |     |     |     | 300 |     |     |     |     |
| Ser | Glu | Thr | Ala | Phe | His | Ser | Ala | Cys | Thr | Tyr | Gly | Lys | Ser | Ile | Asp |
| 305 |     |     |     |     | 310 |     |     |     |     | 315 |     |     |     |     | 320 |
| Leu | Val | Lys | Phe | Leu | Leu | Asp | Gln | Asn | Val | Ile | Asn | Ile | Asn | His | Gln |
|     |     |     | 325 |     |     |     |     |     | 330 |     |     |     |     | 335 |     |
| Gly | Arg | Asp | Gly | His | Thr | Gly | Leu | His | Ser | Ala | Cys | Tyr | His | Gly | His |
|     |     |     | 340 |     |     |     |     | 345 |     |     |     |     | 350 |     |     |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Ile | Arg | Leu | Val | Gln | Phe | Leu | Leu | Asp | Asn | Gly | Ala | Asp | Met | Asn | Leu | 355 | 360 | 365 |     |
| Val | Ala | Cys | Asp | Pro | Ser | Arg | Ser | Ser | Gly | Glu | Lys | Asp | Glu | Gln | Thr | 370 | 375 | 380 |     |
| Cys | Leu | Met | Trp | Ala | Tyr | Glu | Lys | Gly | His | Asp | Ala | Ile | Val | Thr | Leu | 385 | 390 | 395 | 400 |
| Leu | Lys | His | Tyr | Lys | Arg | Pro | Gln | Asp | Glu | Leu | Pro | Cys | Asn | Glu | Tyr | 405 | 410 | 415 |     |
| Ser | Gln | Pro | Gly | Gly | Asp | Gly | Ser | Tyr | Val | Ser | Val | Pro | Ser | Pro | Leu | 420 | 425 | 430 |     |
| Gly | Lys | Ile | Lys | Ser | Met | Thr | Lys | Glu | Lys | Ala | Asp | Ile | Leu | Leu | Leu | 435 | 440 | 445 |     |
| Arg | Ala | Gly | Leu | Pro | Ser | His | Phe | His | Leu | Gln | Leu | Ser | Glu | Ile | Glu | 450 | 455 | 460 |     |
| Phe | His | Glu | Ile | Ile | Gly | Ser | Gly | Ser | Phe | Gly | Lys | Val | Tyr | Lys | Gly | 465 | 470 | 475 | 480 |
| Arg | Cys | Arg | Asn | Lys | Ile | Val | Ala | Ile | Lys | Arg | Tyr | Arg | Ala | Asn | Thr | 485 | 490 | 495 |     |
| Tyr | Cys | Ser | Lys | Ser | Asp | Val | Asp | Met | Phe | Cys | Arg | Glu | Val | Ser | Ile | 500 | 505 | 510 |     |
| Leu | Cys | Gln | Leu | Asn | His | Pro | Cys | Val | Ile | Gln | Phe | Val | Gly | Ala | Cys | 515 | 520 | 525 |     |
| Leu | Asn | Asp | Pro | Ser | Gln | Phe | Ala | Ile | Val | Thr | Gln | Tyr | Ile | Ser | Gly | 530 | 535 | 540 |     |
| Gly | Ser | Leu | Phe | Ser | Leu | Leu | His | Glu | Gln | Lys | Arg | Ile | Leu | Asp | Leu | 545 | 550 | 555 | 560 |
| Gln | Ser | Lys | Leu | Ile | Ile | Ala | Val | Asp | Val | Ala | Lys | Gly | Met | Glu | Tyr | 565 | 570 | 575 |     |
| Leu | His | Asn | Leu | Thr | Gln | Pro | Ile | Ile | His | Arg | Asp | Leu | Asn | Ser | His | 580 | 585 | 590 |     |
| Asn | Ile | Leu | Leu | Tyr | Glu | Asp | Gly | His | Ala | Val | Val | Ala | Asp | Phe | Gly | 595 | 600 | 605 |     |
| Glu | Ser | Arg | Phe | Leu | Gln | Ser | Leu | Asp | Glu | Asp | Asn | Met | Thr | Lys | Gln | 610 | 615 | 620 |     |
| Pro | Gly | Asn | Leu | Arg | Trp | Met | Ala | Pro | Glu | Val | Phe | Thr | Gln | Cys | Thr | 625 | 630 | 635 | 640 |
| Arg | Tyr | Thr | Ile | Lys | Ala | Asp | Val | Phe | Ser | Tyr | Ala | Leu | Cys | Leu | Trp | 645 | 650 | 655 |     |

Glu Ile Leu Thr Gly Glu Ile Pro Phe Ala His Leu Lys Pro Ala Ala  
660 665 670

Ala Ala Ala Asp Met Ala Tyr His His Ile Arg Pro Pro Ile Gly Tyr  
675 680 685

Ser Ile Pro Lys Pro Ile Ser Ser Leu Leu Ile Arg Gly Trp Asn Ala  
690 695 700

Cys Pro Glu Gly Arg Pro Glu Phe Ser Glu Val Val Met Lys Leu Glu  
705 710 715 720

Glu Cys Leu Cys Asn Ile Glu Leu Met Ser Pro Ala Ser Ser Asn Ser  
725 730 735

Ser Gly Ser Leu Ser Pro Ser Ser Ser Ser Asp Cys Leu Val Asn Arg  
740 745 750

Gly Gly Pro Gly Arg Ser His Val Ala Ala Leu Arg Ser Arg Phe Glu  
755 760 765

Leu Glu Tyr Ala Leu Asn Ala Arg Ser Tyr Ala Ala Leu Ser Gln Ser  
770 775 780

Ala Gly Gln Tyr Ser Ser Gln Gly Leu Ser Leu Glu Glu Met Lys Arg  
785 790 795 800

Ser Leu Gln Tyr Thr Pro Ile Asp Lys Tyr Gly Tyr Val Ser Asp Pro  
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Met Ser Ser Met His Phe His Ser Cys Arg Asn Ser Ser Ser Phe Glu  
820 825 830

Asp Ser Ser  
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Met Gly Asn Tyr Lys Ser Arg Pro Thr Gln Thr Cys Thr Asp Glu Trp  
1 5 10 15

aag aaa aaa gtc agt gaa tca tat gtt atc aca ata gaa aga tta gaa 96  
Lys Lys Lys Val Ser Glu Ser Tyr Val Ile Thr Ile Glu Arg Leu Glu  
20 25 30

gat gac ctg cag atc aag gaa aaa gaa ctg aca gaa cta agg aat ata 144



|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|
| Asp | Asp | Leu | Gln | Ile | Lys | Glu | Lys | Glu | Leu | Thr | Glu | Leu | Arg | Asn | Ile |     |  |
|     |     | 35  |     |     |     |     | 40  |     |     |     |     | 45  |     |     |     |     |  |
| ttt | ggc | tct | gat | gaa | gcc | ttc | agt | aaa | gtc | aat | tta | aat | tac | cgc | act | 192 |  |
| Phe | Gly | Ser | Asp | Glu | Ala | Phe | Ser | Lys | Val | Asn | Leu | Asn | Tyr | Arg | Thr |     |  |
|     | 50  |     |     |     |     | 55  |     |     |     |     | 60  |     |     |     |     |     |  |
| gaa | aat | ggg | ctg | tct | cta | ctt | cat | tta | tgt | tgc | att | tgt | gga | ggc | aag | 240 |  |
| Glu | Asn | Gly | Leu | Ser | Leu | Leu | His | Leu | Cys | Cys | Ile | Cys | Gly | Gly | Lys |     |  |
|     | 65  |     |     |     | 70  |     |     |     | 75  |     |     |     |     |     | 80  |     |  |
| aaa | tca | cat | att | cga | act | ctt | atg | ttg | aaa | ggg | ctc | cgc | cca | tct | cga | 288 |  |
| Lys | Ser | His | Ile | Arg | Thr | Leu | Met | Leu | Lys | Gly | Leu | Arg | Pro | Ser | Arg |     |  |
|     |     |     |     | 85  |     |     |     |     | 90  |     |     |     |     | 95  |     |     |  |
| ctg | aca | aga | aat | gga | ttt | aca | gcc | ttg | cat | tta | gca | gtt | tac | aag | gat | 336 |  |
| Leu | Thr | Arg | Asn | Gly | Phe | Thr | Ala | Leu | His | Leu | Ala | Val | Tyr | Lys | Asp |     |  |
|     |     |     | 100 |     |     |     |     | 105 |     |     |     |     | 110 |     |     |     |  |
| aat | gca | gaa | ttg | atc | act | tct | ctg | ctt | cac | agt | gga | gct | gat | ata | cag | 384 |  |
| Asn | Ala | Glu | Leu | Ile | Thr | Ser | Leu | Leu | His | Ser | Gly | Ala | Asp | Ile | Gln |     |  |
|     |     | 115 |     |     |     |     | 120 |     |     |     |     | 125 |     |     |     |     |  |
| cag | gtt | gga | tac | ggt | ggc | ctc | act | gcc | ctc | cat | att | gct | aca | ata | gct | 432 |  |
| Gln | Val | Gly | Tyr | Gly | Gly | Leu | Thr | Ala | Leu | His | Ile | Ala | Thr | Ile | Ala |     |  |
|     | 130 |     |     |     |     | 135 |     |     |     |     | 140 |     |     |     |     |     |  |
| ggc | cac | cta | gag | gct | gct | gat | gtg | ctg | ttg | caa | cat | gga | gct | aat | gtc | 480 |  |
| Gly | His | Leu | Glu | Ala | Ala | Asp | Val | Leu | Leu | Gln | His | Gly | Ala | Asn | Val |     |  |
|     | 145 |     |     |     | 150 |     |     |     |     | 155 |     |     |     |     | 160 |     |  |
| aat | att | caa | gat | gca | gtt | ttt | ttc | act | cca | ttg | cat | att | gca | gcg | tac | 528 |  |
| Asn | Ile | Gln | Asp | Ala | Val | Phe | Phe | Thr | Pro | Leu | His | Ile | Ala | Ala | Tyr |     |  |
|     |     |     |     | 165 |     |     |     |     | 170 |     |     |     |     | 175 |     |     |  |
| tat | gga | cat | gaa | cag | gta | act | cgc | ctt | ctt | ttg | aaa | ttt | ggt | gct | gat | 576 |  |
| Tyr | Gly | His | Glu | Gln | Val | Thr | Arg | Leu | Leu | Leu | Lys | Phe | Gly | Ala | Asp |     |  |
|     |     |     | 180 |     |     |     |     | 185 |     |     |     |     | 190 |     |     |     |  |
| gta | aat | gta | agt | ggt | gaa | gtt | gga | gat | aga | ccc | ctc | cac | cta | gca | tct | 624 |  |
| Val | Asn | Val | Ser | Gly | Glu | Val | Gly | Asp | Arg | Pro | Leu | His | Leu | Ala | Ser |     |  |
|     |     | 195 |     |     |     |     | 200 |     |     |     |     | 205 |     |     |     |     |  |
| gca | aaa | gga | ttc | ttg | aat | att | gca | aaa | ctc | ttg | atg | gaa | gaa | ggc | agc | 672 |  |
| Ala | Lys | Gly | Phe | Leu | Asn | Ile | Ala | Lys | Leu | Leu | Met | Glu | Glu | Gly | Ser |     |  |
|     | 210 |     |     |     |     | 215 |     |     |     |     | 220 |     |     |     |     |     |  |
| aaa | gca | gat | gtg | aat | gct | caa | gat | aat | gaa | gac | cat | gtc | cca | ctc | cat | 720 |  |
| Lys | Ala | Asp | Val | Asn | Ala | Gln | Asp | Asn | Glu | Asp | His | Val | Pro | Leu | His |     |  |
|     | 225 |     |     |     | 230 |     |     |     | 235 |     |     |     |     |     | 240 |     |  |
| ttc | tgt | tct | cga | ttt | gga | cac | cat | gat | ata | gtt | aag | tat | ctg | ctg | caa | 768 |  |
| Phe | Cys | Ser | Arg | Phe | Gly | His | His | Asp | Ile | Val | Lys | Tyr | Leu | Leu | Gln |     |  |
|     |     |     |     | 245 |     |     |     |     | 250 |     |     |     |     | 255 |     |     |  |
| agt | gat | ttg | gaa | gtt | caa | cct | cat | gtt | gtt | aat | atc | tat | gga | gat | acc | 816 |  |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |      |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| Ser | Asp | Leu | Glu | Val | Gln | Pro | His | Val | Val | Asn | Ile | Tyr | Gly | Asp | Thr |      |
|     |     |     | 260 |     |     |     |     | 265 |     |     |     |     | 270 |     |     |      |
| ccc | tta | cac | ctg | gca | tgc | tac | aat | ggc | aaa | ttt | gaa | gtt | gcc | aag | gaa | 864  |
| Pro | Leu | His | Leu | Ala | Cys | Tyr | Asn | Gly | Lys | Phe | Glu | Val | Ala | Lys | Glu |      |
|     |     | 275 |     |     |     |     | 280 |     |     |     | 285 |     |     |     |     |      |
| atc | atc | caa | ata | tca | gga | aca | gaa | agt | ctg | act | aag | gaa | aac | atc | ttc | 912  |
| Ile | Ile | Gln | Ile | Ser | Gly | Thr | Glu | Ser | Leu | Thr | Lys | Glu | Asn | Ile | Phe |      |
|     | 290 |     |     |     |     | 295 |     |     |     | 300 |     |     |     |     |     |      |
| agt | gaa | aca | gct | ttt | cat | agt | gct | tgt | acc | tat | ggc | aag | agc | att | gac | 960  |
| Ser | Glu | Thr | Ala | Phe | His | Ser | Ala | Cys | Thr | Tyr | Gly | Lys | Ser | Ile | Asp |      |
| 305 |     |     |     |     | 310 |     |     |     |     | 315 |     |     |     |     | 320 |      |
| cta | gtc | aaa | ttt | ctt | ctt | gat | cag | aat | gtc | ata | aac | atc | aac | cac | caa | 1008 |
| Leu | Val | Lys | Phe | Leu | Leu | Asp | Gln | Asn | Val | Ile | Asn | Ile | Asn | His | Gln |      |
|     |     |     | 325 |     |     |     |     |     | 330 |     |     |     |     | 335 |     |      |
| gga | agg | gat | ggg | cac | act | gga | tta | cac | tct | gct | tgc | tac | cac | ggg | cac | 1056 |
| Gly | Arg | Asp | Gly | His | Thr | Gly | Leu | His | Ser | Ala | Cys | Tyr | His | Gly | His |      |
|     |     |     | 340 |     |     |     |     | 345 |     |     |     |     | 350 |     |     |      |
| att | cgc | ctg | gtt | cag | ttc | tta | ctg | gat | aat | gga | gct | gat | atg | aat | cta | 1104 |
| Ile | Arg | Leu | Val | Gln | Phe | Leu | Leu | Asp | Asn | Gly | Ala | Asp | Met | Asn | Leu |      |
|     |     | 355 |     |     |     |     | 360 |     |     |     |     | 365 |     |     |     |      |
| gtg | gct | tgt | gat | ccc | agc | agg | tct | agt | ggg | gaa | aaa | gat | gag | cag | aca | 1152 |
| Val | Ala | Cys | Asp | Pro | Ser | Arg | Ser | Ser | Gly | Glu | Lys | Asp | Glu | Gln | Thr |      |
|     | 370 |     |     |     |     | 375 |     |     |     |     | 380 |     |     |     |     |      |
| tgt | ttg | atg | tgg | gct | tat | gaa | aaa | ggg | cat | gat | gcc | att | gtc | aca | ctc | 1200 |
| Cys | Leu | Met | Trp | Ala | Tyr | Glu | Lys | Gly | His | Asp | Ala | Ile | Val | Thr | Leu |      |
| 385 |     |     |     |     | 390 |     |     |     |     | 395 |     |     |     |     | 400 |      |
| ctg | aag | cat | tat | aag | aga | cca | caa | gat | gaa | ttg | ccc | tgt | aat | gaa | tat | 1248 |
| Leu | Lys | His | Tyr | Lys | Arg | Pro | Gln | Asp | Glu | Leu | Pro | Cys | Asn | Glu | Tyr |      |
|     |     |     |     | 405 |     |     |     |     | 410 |     |     |     |     | 415 |     |      |
| tct | cag | cct | gga | gga | gat | ggc | tcc | tat | gtg | tct | gtt | cca | tca | ccc | ttg | 1296 |
| Ser | Gln | Pro | Gly | Gly | Asp | Gly | Ser | Tyr | Val | Ser | Val | Pro | Ser | Pro | Leu |      |
|     |     |     | 420 |     |     |     |     | 425 |     |     |     |     | 430 |     |     |      |
| ggg | aag | att | aaa | agc | atg | aca | aaa | gag | aag | gca | gat | att | ctc | ctc | cta | 1344 |
| Gly | Lys | Ile | Lys | Ser | Met | Thr | Lys | Glu | Lys | Ala | Asp | Ile | Leu | Leu | Leu |      |
|     |     | 435 |     |     |     |     | 440 |     |     |     |     | 445 |     |     |     |      |
| aga | gct | gga | ttg | cct | tca | cat | ttc | cat | ctt | cag | ctc | tca | gaa | att | gag | 1392 |
| Arg | Ala | Gly | Leu | Pro | Ser | His | Phe | His | Leu | Gln | Leu | Ser | Glu | Ile | Glu |      |
|     |     | 450 |     |     |     | 455 |     |     |     |     | 460 |     |     |     |     |      |
| ttc | cat | gag | att | att | ggc | tca | ggg | tct | ttt | ggg | aaa | gta | tat | aaa | gga | 1440 |
| Phe | His | Glu | Ile | Ile | Gly | Ser | Gly | Ser | Phe | Gly | Lys | Val | Tyr | Lys | Gly |      |
| 465 |     |     |     |     | 470 |     |     |     |     | 475 |     |     |     |     | 480 |      |
| cga | tgc | aga | aat | aaa | ata | gtg | gct | ata | aaa | cgt | tat | cga | gcc | aat | acc | 1488 |

|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |      |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| Arg | Cys | Arg | Asn | Lys | Ile | Val | Ala | Ile | Lys | Arg | Tyr | Arg | Ala | Asn | Thr |      |
|     |     |     | 485 |     |     |     |     |     | 490 |     |     |     |     | 495 |     |      |
| tac | tgc | tcc | aag | tca | gat | gtg | gat | atg | ttt | tgc | cga | gag | gtg | tcc | att | 1536 |
| Tyr | Cys | Ser | Lys | Ser | Asp | Val | Asp | Met | Phe | Cys | Arg | Glu | Val | Ser | Ile |      |
|     |     |     | 500 |     |     |     |     | 505 |     |     |     |     | 510 |     |     |      |
| ctc | tgc | cag | ctc | aat | cat | ccc | tgc | gta | att | cag | ttt | gtg | ggt | gct | tgc | 1584 |
| Leu | Cys | Gln | Leu | Asn | His | Pro | Cys | Val | Ile | Gln | Phe | Val | Gly | Ala | Cys |      |
|     |     |     | 515 |     |     |     | 520 |     |     |     |     | 525 |     |     |     |      |
| ttg | aat | gat | ccc | agc | cag | ttt | gcc | att | gtc | act | caa | tac | ata | tca | ggg | 1632 |
| Leu | Asn | Asp | Pro | Ser | Gln | Phe | Ala | Ile | Val | Thr | Gln | Tyr | Ile | Ser | Gly |      |
|     | 530 |     |     |     |     | 535 |     |     |     |     | 540 |     |     |     |     |      |
| ggt | tct | ctg | ttc | tcc | ctc | ctt | cat | gag | cag | aag | agg | att | ctt | gat | ttg | 1680 |
| Gly | Ser | Leu | Phe | Ser | Leu | Leu | His | Glu | Gln | Lys | Arg | Ile | Leu | Asp | Leu |      |
| 545 |     |     |     |     | 550 |     |     |     |     | 555 |     |     |     |     | 560 |      |
| cag | tct | aaa | tta | att | att | gca | gta | gat | gtt | gcc | aaa | ggc | atg | gag | tac | 1728 |
| Gln | Ser | Lys | Leu | Ile | Ile | Ala | Val | Asp | Val | Ala | Lys | Gly | Met | Glu | Tyr |      |
|     |     |     | 565 |     |     |     |     | 570 |     |     |     |     |     | 575 |     |      |
| ctt | cac | aac | ctg | aca | cag | cca | att | ata | cat | cgt | gac | ttg | aac | agt | cac | 1776 |
| Leu | His | Asn | Leu | Thr | Gln | Pro | Ile | Ile | His | Arg | Asp | Leu | Asn | Ser | His |      |
|     |     |     | 580 |     |     |     |     | 585 |     |     |     |     | 590 |     |     |      |
| aat | att | ctt | ctc | tat | gag | gat | ggg | cat | gct | gtg | gtg | gca | gat | ttt | gga | 1824 |
| Asn | Ile | Leu | Leu | Tyr | Glu | Asp | Gly | His | Ala | Val | Val | Ala | Asp | Phe | Gly |      |
|     |     | 595 |     |     |     |     | 600 |     |     |     |     | 605 |     |     |     |      |
| gaa | tca | aga | ttt | cta | cag | tct | ctg | gat | gaa | gac | aac | atg | aca | aaa | caa | 1872 |
| Glu | Ser | Arg | Phe | Leu | Gln | Ser | Leu | Asp | Glu | Asp | Asn | Met | Thr | Lys | Gln |      |
|     | 610 |     |     |     |     | 615 |     |     |     |     | 620 |     |     |     |     |      |
| cct | ggg | aac | ctc | cgt | tgg | atg | gct | cct | gag | gtg | ttc | acg | cag | tgc | act | 1920 |
| Pro | Gly | Asn | Leu | Arg | Trp | Met | Ala | Pro | Glu | Val | Phe | Thr | Gln | Cys | Thr |      |
| 625 |     |     |     | 630 |     |     |     |     |     | 635 |     |     |     |     | 640 |      |
| cgg | tac | acc | atc | aaa | gca | gat | gtc | ttc | agc | tat | gct | ctg | tgt | ctg | tgg | 1968 |
| Arg | Tyr | Thr | Ile | Lys | Ala | Asp | Val | Phe | Ser | Tyr | Ala | Leu | Cys | Leu | Trp |      |
|     |     |     | 645 |     |     |     |     | 650 |     |     |     |     | 655 |     |     |      |
| gaa | att | ctc | act | ggc | gaa | att | cca | ttc | gct | cat | ctc | aag | cca | gcg | gct | 2016 |
| Glu | Ile | Leu | Thr | Gly | Glu | Ile | Pro | Phe | Ala | His | Leu | Lys | Pro | Ala | Ala |      |
|     |     | 660 |     |     |     |     | 665 |     |     |     |     |     | 670 |     |     |      |
| gcg | gca | gca | gac | atg | gct | tac | cac | cac | atc | aga | cct | ccc | att | ggc | tat | 2064 |
| Ala | Ala | Ala | Asp | Met | Ala | Tyr | His | His | Ile | Arg | Pro | Pro | Ile | Gly | Tyr |      |
|     |     | 675 |     |     |     | 680 |     |     |     |     |     | 685 |     |     |     |      |
| tcc | att | ccc | aag | ccc | ata | tca | tct | ctg | ctg | ata | cga | ggg | tgg | aac | gca | 2112 |
| Ser | Ile | Pro | Lys | Pro | Ile | Ser | Ser | Leu | Leu | Ile | Arg | Gly | Trp | Asn | Ala |      |
|     | 690 |     |     |     |     | 695 |     |     |     |     | 700 |     |     |     |     |      |
| tgt | cct | gaa | gga | aga | ccc | gaa | ttt | tct | gaa | gtt | gtc | atg | aag | tta | gaa | 2160 |

|  |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
|--|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|
| Cys  | Pro | Glu | Gly | Arg | Pro | Glu | Phe | Ser | Glu | Val | Val | Met | Lys | Leu | Glu |  |
| 705  |     |     |     |     | 710 |     |     |     |     | 715 |     |     |     |     | 720 |  |
| gag tgt ctc tgc aac att gag ctg atg tct cct gca tca agt aac agc 2208 |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
| Glu  | Cys | Leu | Cys | Asn | Ile | Glu | Leu | Met | Ser | Pro | Ala | Ser | Ser | Asn | Ser |  |
|  |     |     |     | 725 |     |     |     |     | 730 |     |     |     |     | 735 |     |  |
| agt ggg tct ctc tca cct tct tct tct tct gat tgc ctg gtg aac cgg 2256 |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
| Ser  | Gly | Ser | Leu | Ser | Pro | Ser | Ser | Ser | Ser | Asp | Cys | Leu | Val | Asn | Arg |  |
|  |     |     | 740 |     |     |     |     | 745 |     |     |     |     | 750 |     |     |  |
| gga gga cct ggc cgg agt cat gtg gca gca tta aga agt cgt ttc gaa 2304 |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
| Gly  | Gly | Pro | Gly | Arg | Ser | His | Val | Ala | Ala | Leu | Arg | Ser | Arg | Phe | Glu |  |
|  |     | 755 |     |     |     |     | 760 |     |     |     |     |     | 765 |     |     |  |
| ttg gaa tat gct cta aat gca agg tcc tat gct gct ttg tcc caa agt 2352 |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
| Leu  | Glu | Tyr | Ala | Leu | Asn | Ala | Arg | Ser | Tyr | Ala | Ala | Leu | Ser | Gln | Ser |  |
|  | 770 |     |     |     |     | 775 |     |     |     |     | 780 |     |     |     |     |  |
| gct gga caa tat tcc tct caa ggt ctg tct ttg gag gag atg aaa aga 2400 |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
| Ala  | Gly | Gln | Tyr | Ser | Ser | Gln | Gly | Leu | Ser | Leu | Glu | Glu | Met | Lys | Arg |  |
| 785  |     |     |     |     | 790 |     |     |     |     | 795 |     |     |     |     | 800 |  |
| agt ctt caa tac aca ccc att gac aaa tat ggc tat gta tcc gat ccc 2448 |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
| Ser  | Leu | Gln | Tyr | Thr | Pro | Ile | Asp | Lys | Tyr | Gly | Tyr | Val | Ser | Asp | Pro |  |
|  |     |     |     | 805 |     |     |     |     | 810 |     |     |     |     | 815 |     |  |
| atg agc tca atg cat ttt cat tct tgc cga aat agt agc agc ttt gag 2496 |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
| Met  | Ser | Ser | Met | His | Phe | His | Ser | Cys | Arg | Asn | Ser | Ser | Ser | Phe | Glu |  |
|  |     |     | 820 |     |     |     |     | 825 |     |     |     |     |     | 830 |     |  |
| gac agc agc 2505   |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
| Asp  | Ser | Ser |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
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<212> PRT

<213> Artificial Sequence

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<223> Xaa = Leu, Ile, or Val

<220>

<221> VARIANT

<222> 3

<223> Xaa = any amino acid except Pro

<220>

<221> VARIANT

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<223> Xaa = any amino acid except Pro

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<223> Xaa = Phe, Tyr, Trp, Met, Gly, Ser, Thr, Asn,  
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<223> Any 13 Xaa's may be absent - represents a range  
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<221> VARIANT  
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Xaa Lys

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 <223> Asp is an active site residue

<220>  
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 <223> Xaa = Leu, Ile, Val, Met, Phe, Tyr

<220>  
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<220>
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 Met Gly Asn Tyr Lys Ser Arg Pro Thr Gln Thr Cys Ser Asp Glu Trp  
 1 5 10 15

aag aag aaa gtt agt gaa tct tac gct att atc ata gaa agg ctg gag 156  
 Lys Lys Lys Val Ser Glu Ser Tyr Ala Ile Ile Ile Glu Arg Leu Glu  
 20 25 30

gat aac ctg cag atc aaa gaa aat gaa ttt caa gaa cta agg cac atc 204  
 Asp Asn Leu Gln Ile Lys Glu Asn Glu Phe Gln Glu Leu Arg His Ile  
 35 40 45

ttt ggc tct gat gaa gcc ttc agt gaa gtc agt tta aat tac cgc aca 252  
 Phe Gly Ser Asp Glu Ala Phe Ser Glu Val Ser Leu Asn Tyr Arg Thr  
 50 55 60

gag cgt ggc ctg tcc ctg cta cac ctc tgc tgt gtc tgt ggc ggc aac 300  
 Glu Arg Gly Leu Ser Leu Leu His Leu Cys Cys Val Cys Gly Gly Asn  
 65 70 75 80

aag tca cat atc cgt gcc ctt atg tta aaa ggg ctc cgt cca tcc aga 348  
 Lys Ser His Ile Arg Ala Leu Met Leu Lys Gly Leu Arg Pro Ser Arg  
 85 90 95

ctg acg aga aat ggg ttt cca gct ctg cac ctg gcc gtt tac aag gac 396  
 Leu Thr Arg Asn Gly Phe Pro Ala Leu His Leu Ala Val Tyr Lys Asp  
 100 105 110

agc ccg gaa ctt atc act tca ctg ttg cac agc gga gca gat gtt cag 444  
 Ser Pro Glu Leu Ile Thr Ser Leu Leu His Ser Gly Ala Asp Val Gln  
 115 120 125

caa gtg gga tac ggt ggc ctc aca gcc ctc cac ata gct gca ata gct 492  
 Gln Val Gly Tyr Gly Gly Leu Thr Ala Leu His Ile Ala Ala Ile Ala  
 130 135 140

gga cac cca gag gct gca gaa gtg ctg cta caa cat ggg gcc aat gtg 540  
 Gly His Pro Glu Ala Ala Glu Val Leu Leu Gln His Gly Ala Asn Val  
 145 150 155 160

aat gtt caa gat gcc gtc ttc ttc acc cca ctg cac att gca gcc tac 588  
 Asn Val Gln Asp Ala Val Phe Phe Thr Pro Leu His Ile Ala Ala Tyr  
 165 170 175



|   |      |
|---|------|
| tat ggg cac gag cag gta acc agt gtc ctt ttg aag ttt ggt gct gat | 636  |
| Tyr Gly His Glu Gln Val Thr Ser Val Leu Leu Lys Phe Gly Ala Asp |      |
| 180 185 190   |      |
| gtc aat gta agc ggt gaa gtt ggg gac agg cct ctg cac ctg gcc tct | 684  |
| Val Asn Val Ser Gly Glu Val Gly Asp Arg Pro Leu His Leu Ala Ser |      |
| 195 200 205   |      |
| gca aag ggc ttc ttc aac att gtg aaa ctc ctg gta gaa gaa ggg agc | 732  |
| Ala Lys Gly Phe Phe Asn Ile Val Lys Leu Leu Val Glu Glu Gly Ser |      |
| 210 215 220   |      |
| aaa gca gat gtg aac gct cag gac aat gaa gac cac gtc cct ctg cac | 780  |
| Lys Ala Asp Val Asn Ala Gln Asp Asn Glu Asp His Val Pro Leu His |      |
| 225 230 235 240   |      |
| ttc tgt tct cga ttt gga cac cac aat ata gtg agc tac ctg ctc cag | 828  |
| Phe Cys Ser Arg Phe Gly His His Asn Ile Val Ser Tyr Leu Leu Gln |      |
| 245 250 255   |      |
| agt gac tta gag gtc cag cct cac gtc att aac atc tat ggt gac act | 876  |
| Ser Asp Leu Glu Val Gln Pro His Val Ile Asn Ile Tyr Gly Asp Thr |      |
| 260 265 270   |      |
| cct ttg cac ctg gca tgc tac aat gga aat ttt gaa gtt gcc aag gaa | 924  |
| Pro Leu His Leu Ala Cys Tyr Asn Gly Asn Phe Glu Val Ala Lys Glu |      |
| 275 280 285   |      |
| att gtc cag gta aca gga act gaa agt ctg act aag gaa aac atc ttc | 972  |
| Ile Val Gln Val Thr Gly Thr Glu Ser Leu Thr Lys Glu Asn Ile Phe |      |
| 290 295 300   |      |
| agc gag aca gct ttt cac agt gct tgt acc tat ggc aag aac att gac | 1020 |
| Ser Glu Thr Ala Phe His Ser Ala Cys Thr Tyr Gly Lys Asn Ile Asp |      |
| 305 310 315 320   |      |
| ctg gtc aaa ttt ctt ctt gat cag aat gct gtg aac att aac cac cga | 1068 |
| Leu Val Lys Phe Leu Leu Asp Gln Asn Ala Val Asn Ile Asn His Arg |      |
| 325 330 335   |      |
| gga aga gat ggg cac aca gga ttg cac tct gct tgc tac cac ggc cat | 1116 |
| Gly Arg Asp Gly His Thr Gly Leu His Ser Ala Cys Tyr His Gly His |      |
| 340 345 350   |      |
| atc cgc ctg gtt cag ttc cta ctt gat aat ggt gca gat atg aat ctt | 1164 |
| Ile Arg Leu Val Gln Phe Leu Leu Asp Asn Gly Ala Asp Met Asn Leu |      |
| 355 360 365   |      |
| gtc gct tgt gat ccc agc agg tct agt ggt gaa aaa gat gag cag aca | 1212 |
| Val Ala Cys Asp Pro Ser Arg Ser Ser Gly Glu Lys Asp Glu Gln Thr |      |
| 370 375 380   |      |
| tgt ttg atg tgg gct tac gag aaa gga cat gat gcc att gtt aca ctc | 1260 |
| Cys Leu Met Trp Ala Tyr Glu Lys Gly His Asp Ala Ile Val Thr Leu |      |
| 385 390 395 400   |      |

|   |      |
|---|------|
| ctg aag cac tac aag aga ccc cag gag gag ctg cca tgt aac gaa tat | 1308 |
| Leu Lys His Tyr Lys Arg Pro Gln Glu Glu Leu Pro Cys Asn Glu Tyr |      |
| 405 410 415   |      |
| tcc cag cct gga gga gat ggc tcc tat gtg tct gtt cct tcc ccc ttg | 1356 |
| Ser Gln Pro Gly Gly Asp Gly Ser Tyr Val Ser Val Pro Ser Pro Leu |      |
| 420 425 430   |      |
| ggc aag att aaa agc atg aca aaa gag aag gca gat gtt ctc ctc ctg | 1404 |
| Gly Lys Ile Lys Ser Met Thr Lys Glu Lys Ala Asp Val Leu Leu Leu |      |
| 435 440 445   |      |
| agg gct gaa cta ccc tcc cgc ttc cat ctc caa ctc tcc gaa atc gag | 1452 |
| Arg Ala Glu Leu Pro Ser Arg Phe His Leu Gln Leu Ser Glu Ile Glu |      |
| 450 455 460   |      |
| ttc cac gag att atc ggc tcg ggt tcc ttt ggg aaa gtc tat aaa ggg | 1500 |
| Phe His Glu Ile Ile Gly Ser Gly Ser Phe Gly Lys Val Tyr Lys Gly |      |
| 465 470 475 480   |      |
| cga tgc aga aat aaa ata gtg gcg atc aaa cga tac cga gcc aac acc | 1548 |
| Arg Cys Arg Asn Lys Ile Val Ala Ile Lys Arg Tyr Arg Ala Asn Thr |      |
| 485 490 495   |      |
| tac tgc tcc aag tca gac gtg gat atg ttt tgc cga gag gtg tcc att | 1596 |
| Tyr Cys Ser Lys Ser Asp Val Asp Met Phe Cys Arg Glu Val Ser Ile |      |
| 500 505 510   |      |
| ctc tgc cag ctc aac cac ccc tgc gtg gtt cag ttt gtg ggt gcc tgc | 1644 |
| Leu Cys Gln Leu Asn His Pro Cys Val Val Gln Phe Val Gly Ala Cys |      |
| 515 520 525   |      |
| ctg gat gac ccc agt cag ttt gcc att gtc act cag tac att tca gga | 1692 |
| Leu Asp Asp Pro Ser Gln Phe Ala Ile Val Thr Gln Tyr Ile Ser Gly |      |
| 530 535 540   |      |
| ggc tcc ctg ttc tcc ctg ctt cat gaa cag aag aga att ctt gac ttg | 1740 |
| Gly Ser Leu Phe Ser Leu Leu His Glu Gln Lys Arg Ile Leu Asp Leu |      |
| 545 550 555 560   |      |
| cag tct aaa tta atc att gcg gta gac gtt gcc aag ggc atg gag tac | 1788 |
| Gln Ser Lys Leu Ile Ile Ala Val Asp Val Ala Lys Gly Met Glu Tyr |      |
| 565 570 575   |      |
| ctg cac agc ttg acc cag cca atc ata cac cgc gac ctg aac agc cac | 1836 |
| Leu His Ser Leu Thr Gln Pro Ile Ile His Arg Asp Leu Asn Ser His |      |
| 580 585 590   |      |
| aat att ctg ctc tat gag gat ggc cat gct gtg gtg gca gat ttt gga | 1884 |
| Asn Ile Leu Leu Tyr Glu Asp Gly His Ala Val Val Ala Asp Phe Gly |      |
| 595 600 605   |      |
| gaa tca aga ttt ctg cag tcc ctg gat gaa gac aac atg aca aag cag | 1932 |
| Glu Ser Arg Phe Leu Gln Ser Leu Asp Glu Asp Asn Met Thr Lys Gln |      |
| 610 615 620   |      |

|   |      |
|---|------|
| cca ggg aac ctg cgc tgg atg gcc cct gag gtg ttc aca cag tgc acg<br>Pro Gly Asn Leu Arg Trp Met Ala Pro Glu Val Phe Thr Gln Cys Thr<br>625 630 635 640 | 1980 |
| aga tac acc atc aag gct gat gtc ttc agt tac tcc ctg tgt ctg tgg<br>Arg Tyr Thr Ile Lys Ala Asp Val Phe Ser Tyr Ser Leu Cys Leu Trp<br>645 650 655     | 2028 |
| gag ctc ctc act gga gaa att cca ttc gct cat ctc aag cca gcc gct<br>Glu Leu Leu Thr Gly Glu Ile Pro Phe Ala His Leu Lys Pro Ala Ala<br>660 665 670     | 2076 |
| gca gca gca gat atg gcg tat cac cac atc aga ccg ccc atc ggc tat<br>Ala Ala Ala Asp Met Ala Tyr His His Ile Arg Pro Pro Ile Gly Tyr<br>675 680 685     | 2124 |
| tcc atc ccc aag ccc atc tca tcc ctg ctg ata cgg ggc tgg aat gca<br>Ser Ile Pro Lys Pro Ile Ser Ser Leu Leu Ile Arg Gly Trp Asn Ala<br>690 695 700     | 2172 |
| tgt cct gaa gga cga cca gag ttc tct gaa gtc gtt agc aaa ctg gag<br>Cys Pro Glu Gly Arg Pro Glu Phe Ser Glu Val Val Ser Lys Leu Glu<br>705 710 715 720 | 2220 |
| gag tgc cta tgc aat gtg gag ctc atg tct cca gca tca agt aac agc<br>Glu Cys Leu Cys Asn Val Glu Leu Met Ser Pro Ala Ser Ser Asn Ser<br>725 730 735     | 2268 |
| agt ggc tct ctg tca cct tcc tct tct tcc gat tgc ctg ctg agc cgg<br>Ser Gly Ser Leu Ser Pro Ser Ser Ser Ser Asp Cys Leu Leu Ser Arg<br>740 745 750     | 2316 |
| gga ggg cct ggc cgg agc cac gtg gca gcc tta cgg agc cgt ttt gag<br>Gly Gly Pro Gly Arg Ser His Val Ala Ala Leu Arg Ser Arg Phe Glu<br>755 760 765     | 2364 |
| ttg gag tat gcc cta aat gca agg tcc tat gct ggg tgg tcc caa agt<br>Leu Glu Tyr Ala Leu Asn Ala Arg Ser Tyr Ala Gly Trp Ser Gln Ser<br>770 775 780     | 2412 |
| gtt gga aca cac tct aat ccg ggc ctg tct ttg gag gag atg aat agg<br>Val Gly Thr His Ser Asn Pro Gly Leu Ser Leu Glu Glu Met Asn Arg<br>785 790 795 800 | 2460 |
| agc acc cag tat tca act gtt gac aaa tac ggc tat gtg tct gat ccc<br>Ser Thr Gln Tyr Ser Thr Val Asp Lys Tyr Gly Tyr Val Ser Asp Pro<br>805 810 815     | 2508 |
| atg agc ctg acg cac ctt cac tcc cgc caa gac gac agc aac ttt gag<br>Met Ser Leu Thr His Leu His Ser Arg Gln Asp Asp Ser Asn Phe Glu<br>820 825 830     | 2556 |
| gac agc aac tgacaggtct ggcatacacc taaggggcgt ctccccatca<br>Asp Ser Asn<br>835   | 2605 |

ggctgacagc agtgatttta cccatggcag gcttgcttcc aattataacg ccttgccctc 2665  
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 35 40 45  
 Phe Gly Ser Asp Glu Ala Phe Ser Glu Val Ser Leu Asn Tyr Arg Thr  
 50 55 60  
 Glu Arg Gly Leu Ser Leu Leu His Leu Cys Cys Val Cys Gly Gly Asn  
 65 70 75 80  
 Lys Ser His Ile Arg Ala Leu Met Leu Lys Gly Leu Arg Pro Ser Arg  
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 Leu Thr Arg Asn Gly Phe Pro Ala Leu His Leu Ala Val Tyr Lys Asp  
 100 105 110  
 Ser Pro Glu Leu Ile Thr Ser Leu Leu His Ser Gly Ala Asp Val Gln  
 115 120 125  
 Gln Val Gly Tyr Gly Gly Leu Thr Ala Leu His Ile Ala Ala Ile Ala  
 130 135 140  
 Gly His Pro Glu Ala Ala Glu Val Leu Leu Gln His Gly Ala Asn Val  
 145 150 155 160  
 Asn Val Gln Asp Ala Val Phe Phe Thr Pro Leu His Ile Ala Ala Tyr  
 165 170 175

Tyr Gly His Glu Gln Val Thr Ser Val Leu Leu Lys Phe Gly Ala Asp  
 180 185 190  
 Val Asn Val Ser Gly Glu Val Gly Asp Arg Pro Leu His Leu Ala Ser  
 195 200 205  
 Ala Lys Gly Phe Phe Asn Ile Val Lys Leu Leu Val Glu Glu Gly Ser  
 210 215 220  
 Lys Ala Asp Val Asn Ala Gln Asp Asn Glu Asp His Val Pro Leu His  
 225 230 235 240  
 Phe Cys Ser Arg Phe Gly His His Asn Ile Val Ser Tyr Leu Leu Gln  
 245 250 255  
 Ser Asp Leu Glu Val Gln Pro His Val Ile Asn Ile Tyr Gly Asp Thr  
 260 265 270  
 Pro Leu His Leu Ala Cys Tyr Asn Gly Asn Phe Glu Val Ala Lys Glu  
 275 280 285  
 Ile Val Gln Val Thr Gly Thr Glu Ser Leu Thr Lys Glu Asn Ile Phe  
 290 295 300  
 Ser Glu Thr Ala Phe His Ser Ala Cys Thr Tyr Gly Lys Asn Ile Asp  
 305 310 315 320  
 Leu Val Lys Phe Leu Leu Asp Gln Asn Ala Val Asn Ile Asn His Arg  
 325 330 335  
 Gly Arg Asp Gly His Thr Gly Leu His Ser Ala Cys Tyr His Gly His  
 340 345 350  
 Ile Arg Leu Val Gln Phe Leu Leu Asp Asn Gly Ala Asp Met Asn Leu  
 355 360 365  
 Val Ala Cys Asp Pro Ser Arg Ser Ser Gly Glu Lys Asp Glu Gln Thr  
 370 375 380  
 Cys Leu Met Trp Ala Tyr Glu Lys Gly His Asp Ala Ile Val Thr Leu  
 385 390 395 400  
 Leu Lys His Tyr Lys Arg Pro Gln Glu Glu Leu Pro Cys Asn Glu Tyr  
 405 410 415  
 Ser Gln Pro Gly Gly Asp Gly Ser Tyr Val Ser Val Pro Ser Pro Leu  
 420 425 430  
 Gly Lys Ile Lys Ser Met Thr Lys Glu Lys Ala Asp Val Leu Leu Leu  
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 Arg Ala Glu Leu Pro Ser Arg Phe His Leu Gln Leu Ser Glu Ile Glu  
 450 455 460  
 Phe His Glu Ile Ile Gly Ser Gly Ser Phe Gly Lys Val Tyr Lys Gly

|   |  |     |  |     |  |     |
|---|--|-----|--|-----|--|-----|
| 465   |  | 470 |  | 475 |  | 480 |
| Arg Cys Arg Asn Lys Ile Val Ala Ile Lys Arg Tyr Arg Ala Asn Thr |  |     |  |     |  |     |
|   |  | 485 |  | 490 |  | 495 |
| Tyr Cys Ser Lys Ser Asp Val Asp Met Phe Cys Arg Glu Val Ser Ile |  |     |  |     |  |     |
|   |  | 500 |  | 505 |  | 510 |
| Leu Cys Gln Leu Asn His Pro Cys Val Val Gln Phe Val Gly Ala Cys |  |     |  |     |  |     |
|   |  | 515 |  | 520 |  | 525 |
| Leu Asp Asp Pro Ser Gln Phe Ala Ile Val Thr Gln Tyr Ile Ser Gly |  |     |  |     |  |     |
|   |  | 530 |  | 535 |  | 540 |
| Gly Ser Leu Phe Ser Leu Leu His Glu Gln Lys Arg Ile Leu Asp Leu |  |     |  |     |  |     |
| 545   |  | 550 |  | 555 |  | 560 |
| Gln Ser Lys Leu Ile Ile Ala Val Asp Val Ala Lys Gly Met Glu Tyr |  |     |  |     |  |     |
|   |  | 565 |  | 570 |  | 575 |
| Leu His Ser Leu Thr Gln Pro Ile Ile His Arg Asp Leu Asn Ser His |  |     |  |     |  |     |
|   |  | 580 |  | 585 |  | 590 |
| Asn Ile Leu Leu Tyr Glu Asp Gly His Ala Val Val Ala Asp Phe Gly |  |     |  |     |  |     |
|   |  | 595 |  | 600 |  | 605 |
| Glu Ser Arg Phe Leu Gln Ser Leu Asp Glu Asp Asn Met Thr Lys Gln |  |     |  |     |  |     |
|   |  | 610 |  | 615 |  | 620 |
| Pro Gly Asn Leu Arg Trp Met Ala Pro Glu Val Phe Thr Gln Cys Thr |  |     |  |     |  |     |
| 625   |  | 630 |  | 635 |  | 640 |
| Arg Tyr Thr Ile Lys Ala Asp Val Phe Ser Tyr Ser Leu Cys Leu Trp |  |     |  |     |  |     |
|   |  | 645 |  | 650 |  | 655 |
| Glu Leu Leu Thr Gly Glu Ile Pro Phe Ala His Leu Lys Pro Ala Ala |  |     |  |     |  |     |
|   |  | 660 |  | 665 |  | 670 |
| Ala Ala Ala Asp Met Ala Tyr His His Ile Arg Pro Pro Ile Gly Tyr |  |     |  |     |  |     |
|   |  | 675 |  | 680 |  | 685 |
| Ser Ile Pro Lys Pro Ile Ser Ser Leu Leu Ile Arg Gly Trp Asn Ala |  |     |  |     |  |     |
|   |  | 690 |  | 695 |  | 700 |
| Cys Pro Glu Gly Arg Pro Glu Phe Ser Glu Val Val Ser Lys Leu Glu |  |     |  |     |  |     |
| 705   |  | 710 |  | 715 |  | 720 |
| Glu Cys Leu Cys Asn Val Glu Leu Met Ser Pro Ala Ser Ser Asn Ser |  |     |  |     |  |     |
|   |  | 725 |  | 730 |  | 735 |
| Ser Gly Ser Leu Ser Pro Ser Ser Ser Ser Asp Cys Leu Leu Ser Arg |  |     |  |     |  |     |
|   |  | 740 |  | 745 |  | 750 |
| Gly Gly Pro Gly Arg Ser His Val Ala Ala Leu Arg Ser Arg Phe Glu |  |     |  |     |  |     |
|   |  | 755 |  | 760 |  | 765 |

Leu Glu Tyr Ala Leu Asn Ala Arg Ser Tyr Ala Gly Trp Ser Gln Ser  
 770 775 780

Val Gly Thr His Ser Asn Pro Gly Leu Ser Leu Glu Glu Met Asn Arg  
 785 790 795 800

Ser Thr Gln Tyr Ser Thr Val Asp Lys Tyr Gly Tyr Val Ser Asp Pro  
 805 810 815

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 820 825 830

Asp Ser Asn  
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<211> 2505

<212> DNA

<213> Rattus norvegicus

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 1 5 10 15

aag aag aaa gtt agt gaa tct tac gct att atc ata gaa agg ctg gag 96  
 Lys Lys Lys Val Ser Glu Ser Tyr Ala Ile Ile Ile Glu Arg Leu Glu  
 20 25 30

gat aac ctg cag atc aaa gaa aat gaa ttt caa gaa cta agg cac atc 144  
 Asp Asn Leu Gln Ile Lys Glu Asn Glu Phe Gln Glu Leu Arg His Ile  
 35 40 45

ttt ggc tct gat gaa gcc ttc agt gaa gtc agt tta aat tac cgc aca 192  
 Phe Gly Ser Asp Glu Ala Phe Ser Glu Val Ser Leu Asn Tyr Arg Thr  
 50 55 60

gag cgt ggc ctg tcc ctg cta cac ctc tgc tgt gtc tgt ggc ggc aac 240  
 Glu Arg Gly Leu Ser Leu Leu His Leu Cys Cys Val Cys Gly Gly Asn  
 65 70 75 80

aag tca cat atc cgt gcc ctt atg tta aaa ggg ctc cgt cca tcc aga 288  
 Lys Ser His Ile Arg Ala Leu Met Leu Lys Gly Leu Arg Pro Ser Arg  
 85 90 95

ctg acg aga aat ggg ttt cca gct ctg cac ctg gcc gtt tac aag gac 336  
 Leu Thr Arg Asn Gly Phe Pro Ala Leu His Leu Ala Val Tyr Lys Asp  
 100 105 110

agc ccg gaa ctt atc act tca ctg ttg cac agc gga gca gat gtt cag 384  
 Ser Pro Glu Leu Ile Thr Ser Leu Leu His Ser Gly Ala Asp Val Gln

| 115   | 120 | 125 |      |
|---|-----|-----|------|
| caa gtg gga tac ggt ggc ctc aca gcc ctc cac ata gct gca ata gct |     |     | 432  |
| Gln Val Gly Tyr Gly Gly Leu Thr Ala Leu His Ile Ala Ala Ile Ala |     |     |      |
| 130   | 135 | 140 |      |
| gga cac cca gag gct gca gaa gtg ctg cta caa cat ggg gcc aat gtg |     |     | 480  |
| Gly His Pro Glu Ala Ala Glu Val Leu Leu Gln His Gly Ala Asn Val |     |     |      |
| 145   | 150 | 155 | 160  |
| aat gtt caa gat gcc gtc ttc ttc acc cca ctg cac att gca gcc tac |     |     | 528  |
| Asn Val Gln Asp Ala Val Phe Phe Thr Pro Leu His Ile Ala Ala Tyr |     |     |      |
| 165   | 170 | 175 |      |
| tat ggg cac gag cag gta acc agt gtc ctt ttg aag ttt ggt gct gat |     |     | 576  |
| Tyr Gly His Glu Gln Val Thr Ser Val Leu Leu Lys Phe Gly Ala Asp |     |     |      |
| 180   | 185 | 190 |      |
| gtc aat gta agc ggt gaa gtt ggg gac agg cct ctg cac ctg gcc tct |     |     | 624  |
| Val Asn Val Ser Gly Glu Val Gly Asp Arg Pro Leu His Leu Ala Ser |     |     |      |
| 195   | 200 | 205 |      |
| gca aag ggc ttc ttc aac att gtg aaa ctc ctg gta gaa gaa ggg agc |     |     | 672  |
| Ala Lys Gly Phe Phe Asn Ile Val Lys Leu Leu Val Glu Glu Gly Ser |     |     |      |
| 210   | 215 | 220 |      |
| aaa gca gat gtg aac gct cag gac aat gaa gac cac gtc cct ctg cac |     |     | 720  |
| Lys Ala Asp Val Asn Ala Gln Asp Asn Glu Asp His Val Pro Leu His |     |     |      |
| 225   | 230 | 235 | 240  |
| ttc tgt tct cga ttt gga cac cac aat ata gtg agc tac ctg ctc cag |     |     | 768  |
| Phe Cys Ser Arg Phe Gly His His Asn Ile Val Ser Tyr Leu Leu Gln |     |     |      |
| 245   | 250 | 255 |      |
| agt gac tta gag gtc cag cct cac gtc att aac atc tat ggt gac act |     |     | 816  |
| Ser Asp Leu Glu Val Gln Pro His Val Ile Asn Ile Tyr Gly Asp Thr |     |     |      |
| 260   | 265 | 270 |      |
| cct ttg cac ctg gca tgc tac aat gga aat ttt gaa gtt gcc aag gaa |     |     | 864  |
| Pro Leu His Leu Ala Cys Tyr Asn Gly Asn Phe Glu Val Ala Lys Glu |     |     |      |
| 275   | 280 | 285 |      |
| att gtc cag gta aca gga act gaa agt ctg act aag gaa aac atc ttc |     |     | 912  |
| Ile Val Gln Val Thr Gly Thr Glu Ser Leu Thr Lys Glu Asn Ile Phe |     |     |      |
| 290   | 295 | 300 |      |
| agc gag aca gct ttt cac agt gct tgt acc tat ggc aag aac att gac |     |     | 960  |
| Ser Glu Thr Ala Phe His Ser Ala Cys Thr Tyr Gly Lys Asn Ile Asp |     |     |      |
| 305   | 310 | 315 | 320  |
| ctg gtc aaa ttt ctt ctt gat cag aat gct gtg aac att aac cac cga |     |     | 1008 |
| Leu Val Lys Phe Leu Leu Asp Gln Asn Ala Val Asn Ile Asn His Arg |     |     |      |
| 325   | 330 | 335 |      |
| gga aga gat ggg cac aca gga ttg cac tct gct tgc tac cac ggc cat |     |     | 1056 |
| Gly Arg Asp Gly His Thr Gly Leu His Ser Ala Cys Tyr His Gly His |     |     |      |



| 340 |     |     |     |     |     |     |     |     |     | 345 |     |     |     |     |     |      |  |  |  | 350 |  |  |  |  |  |  |  |  |  |  |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|--|--|--|-----|--|--|--|--|--|--|--|--|--|--|
| atc | cgc | ctg | gtt | cag | ttc | cta | ctt | gat | aat | ggg | gca | gat | atg | aat | ctt | 1104 |  |  |  |     |  |  |  |  |  |  |  |  |  |  |
| Ile | Arg | Leu | Val | Gln | Phe | Leu | Leu | Asp | Asn | Gly | Ala | Asp | Met | Asn | Leu |      |  |  |  |     |  |  |  |  |  |  |  |  |  |  |
| 355 |     |     |     |     | 360 |     |     |     |     | 365 |     |     |     |     |     |      |  |  |  |     |  |  |  |  |  |  |  |  |  |  |
| gtc | gct | tgt | gat | ccc | agc | agg | tct | agt | ggg | gaa | aaa | gat | gag | cag | aca | 1152 |  |  |  |     |  |  |  |  |  |  |  |  |  |  |
| Val | Ala | Cys | Asp | Pro | Ser | Arg | Ser | Ser | Gly | Glu | Lys | Asp | Glu | Gln | Thr |      |  |  |  |     |  |  |  |  |  |  |  |  |  |  |
| 370 |     |     |     |     | 375 |     |     |     |     | 380 |     |     |     |     |     |      |  |  |  |     |  |  |  |  |  |  |  |  |  |  |
| tgt | ttg | atg | tgg | gct | tac | gag | aaa | gga | cat | gat | gcc | att | gtt | aca | ctc | 1200 |  |  |  |     |  |  |  |  |  |  |  |  |  |  |
| Cys | Leu | Met | Trp | Ala | Tyr | Glu | Lys | Gly | His | Asp | Ala | Ile | Val | Thr | Leu |      |  |  |  |     |  |  |  |  |  |  |  |  |  |  |
| 385 |     |     |     |     | 390 |     |     |     |     | 395 |     |     |     |     | 400 |      |  |  |  |     |  |  |  |  |  |  |  |  |  |  |
| ctg | aag | cac | tac | aag | aga | ccc | cag | gag | gag | ctg | cca | tgt | aac | gaa | tat | 1248 |  |  |  |     |  |  |  |  |  |  |  |  |  |  |
| Leu | Lys | His | Tyr | Lys | Arg | Pro | Gln | Glu | Glu | Leu | Pro | Cys | Asn | Glu | Tyr |      |  |  |  |     |  |  |  |  |  |  |  |  |  |  |
| 405 |     |     |     |     | 410 |     |     |     |     | 415 |     |     |     |     |     |      |  |  |  |     |  |  |  |  |  |  |  |  |  |  |
| tcc | cag | cct | gga | gga | gat | ggc | tcc | tat | gtg | tct | gtt | cct | tcc | ccc | ttg | 1296 |  |  |  |     |  |  |  |  |  |  |  |  |  |  |
| Ser | Gln | Pro | Gly | Gly | Asp | Gly | Ser | Tyr | Val | Ser | Val | Pro | Ser | Pro | Leu |      |  |  |  |     |  |  |  |  |  |  |  |  |  |  |
| 420 |     |     |     |     | 425 |     |     |     |     | 430 |     |     |     |     |     |      |  |  |  |     |  |  |  |  |  |  |  |  |  |  |
| ggc | aag | att | aaa | agc | atg | aca | aaa | gag | aag | gca | gat | gtt | ctc | ctc | ctg | 1344 |  |  |  |     |  |  |  |  |  |  |  |  |  |  |
| Gly | Lys | Ile | Lys | Ser | Met | Thr | Lys | Glu | Lys | Ala | Asp | Val | Leu | Leu | Leu |      |  |  |  |     |  |  |  |  |  |  |  |  |  |  |
| 435 |     |     |     |     | 440 |     |     |     |     | 445 |     |     |     |     |     |      |  |  |  |     |  |  |  |  |  |  |  |  |  |  |
| agg | gct | gaa | cta | ccc | tcc | cgc | ttc | cat | ctc | caa | ctc | tcc | gaa | atc | gag | 1392 |  |  |  |     |  |  |  |  |  |  |  |  |  |  |
| Arg | Ala | Glu | Leu | Pro | Ser | Arg | Phe | His | Leu | Gln | Leu | Ser | Glu | Ile | Glu |      |  |  |  |     |  |  |  |  |  |  |  |  |  |  |
| 450 |     |     |     |     | 455 |     |     |     |     | 460 |     |     |     |     |     |      |  |  |  |     |  |  |  |  |  |  |  |  |  |  |
| ttc | cac | gag | att | atc | ggc | tcg | ggg | tcc | ttt | ggg | aaa | gtc | tat | aaa | ggg | 1440 |  |  |  |     |  |  |  |  |  |  |  |  |  |  |
| Phe | His | Glu | Ile | Ile | Gly | Ser | Gly | Ser | Phe | Gly | Lys | Val | Tyr | Lys | Gly |      |  |  |  |     |  |  |  |  |  |  |  |  |  |  |
| 465 |     |     |     |     | 470 |     |     |     |     | 475 |     |     |     |     | 480 |      |  |  |  |     |  |  |  |  |  |  |  |  |  |  |
| cga | tgc | aga | aat | aaa | ata | gtg | gcg | atc | aaa | cga | tac | cga | gcc | aac | acc | 1488 |  |  |  |     |  |  |  |  |  |  |  |  |  |  |
| Arg | Cys | Arg | Asn | Lys | Ile | Val | Ala | Ile | Lys | Arg | Tyr | Arg | Ala | Asn | Thr |      |  |  |  |     |  |  |  |  |  |  |  |  |  |  |
| 485 |     |     |     |     | 490 |     |     |     |     | 495 |     |     |     |     |     |      |  |  |  |     |  |  |  |  |  |  |  |  |  |  |
| tac | tgc | tcc | aag | tca | gac | gtg | gat | atg | ttt | tgc | cga | gag | gtg | tcc | att | 1536 |  |  |  |     |  |  |  |  |  |  |  |  |  |  |
| Tyr | Cys | Ser | Lys | Ser | Asp | Val | Asp | Met | Phe | Cys | Arg | Glu | Val | Ser | Ile |      |  |  |  |     |  |  |  |  |  |  |  |  |  |  |
| 500 |     |     |     |     | 505 |     |     |     |     | 510 |     |     |     |     |     |      |  |  |  |     |  |  |  |  |  |  |  |  |  |  |
| ctc | tgc | cag | ctc | aac | cac | ccc | tgc | gtg | gtt | cag | ttt | gtg | ggg | gcc | tgc | 1584 |  |  |  |     |  |  |  |  |  |  |  |  |  |  |
| Leu | Cys | Gln | Leu | Asn | His | Pro | Cys | Val | Val | Gln | Phe | Val | Gly | Ala | Cys |      |  |  |  |     |  |  |  |  |  |  |  |  |  |  |
| 515 |     |     |     |     | 520 |     |     |     |     | 525 |     |     |     |     |     |      |  |  |  |     |  |  |  |  |  |  |  |  |  |  |
| ctg | gat | gac | ccc | agt | cag | ttt | gcc | att | gtc | act | cag | tac | att | tca | gga | 1632 |  |  |  |     |  |  |  |  |  |  |  |  |  |  |
| Leu | Asp | Asp | Pro | Ser | Gln | Phe | Ala | Ile | Val | Thr | Gln | Tyr | Ile | Ser | Gly |      |  |  |  |     |  |  |  |  |  |  |  |  |  |  |
| 530 |     |     |     |     | 535 |     |     |     |     | 540 |     |     |     |     |     |      |  |  |  |     |  |  |  |  |  |  |  |  |  |  |
| ggc | tcc | ctg | ttc | tcc | ctg | ctt | cat | gaa | cag | aag | aga | att | ctt | gac | ttg | 1680 |  |  |  |     |  |  |  |  |  |  |  |  |  |  |
| Gly | Ser | Leu | Phe | Ser | Leu | Leu | His | Glu | Gln | Lys | Arg | Ile | Leu | Asp | Leu |      |  |  |  |     |  |  |  |  |  |  |  |  |  |  |
| 545 |     |     |     |     | 550 |     |     |     |     | 555 |     |     |     |     | 560 |      |  |  |  |     |  |  |  |  |  |  |  |  |  |  |
| cag | tct | aaa | tta | atc | att | gcg | gta | gac | gtt | gcc | aag | ggc | atg | gag | tac | 1728 |  |  |  |     |  |  |  |  |  |  |  |  |  |  |
| Gln | Ser | Lys | Leu | Ile | Ile | Ala | Val | Asp | Val | Ala | Lys | Gly | Met | Glu | Tyr |      |  |  |  |     |  |  |  |  |  |  |  |  |  |  |

| 565 |     |     |     |     | 570 |     |     |     |     | 575 |     |     |     |     |     |      |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| ctg | cac | agc | ttg | acc | cag | cca | atc | ata | cac | cgc | gac | ctg | aac | agc | cac | 1776 |
| Leu | His | Ser | Leu | Thr | Gln | Pro | Ile | Ile | His | Arg | Asp | Leu | Asn | Ser | His |      |
|     |     |     | 580 |     |     |     |     | 585 |     |     |     |     | 590 |     |     |      |
| aat | att | ctg | ctc | tat | gag | gat | ggc | cat | gct | gtg | gtg | gca | gat | ttt | gga | 1824 |
| Asn | Ile | Leu | Leu | Tyr | Glu | Asp | Gly | His | Ala | Val | Val | Ala | Asp | Phe | Gly |      |
|     |     | 595 |     |     |     |     | 600 |     |     |     |     | 605 |     |     |     |      |
| gaa | tca | aga | ttt | ctg | cag | tcc | ctg | gat | gaa | gac | aac | atg | aca | aag | cag | 1872 |
| Glu | Ser | Arg | Phe | Leu | Gln | Ser | Leu | Asp | Glu | Asp | Asn | Met | Thr | Lys | Gln |      |
|     | 610 |     |     |     |     | 615 |     |     |     |     | 620 |     |     |     |     |      |
| cca | ggg | aac | ctg | cgc | tgg | atg | gcc | cct | gag | gtg | ttc | aca | cag | tgc | acg | 1920 |
| Pro | Gly | Asn | Leu | Arg | Trp | Met | Ala | Pro | Glu | Val | Phe | Thr | Gln | Cys | Thr |      |
| 625 |     |     |     |     | 630 |     |     |     | 635 |     |     |     |     |     | 640 |      |
| aga | tac | acc | atc | aag | gct | gat | gtc | ttc | agt | tac | tcc | ctg | tgt | ctg | tgg | 1968 |
| Arg | Tyr | Thr | Ile | Lys | Ala | Asp | Val | Phe | Ser | Tyr | Ser | Leu | Cys | Leu | Trp |      |
|     |     |     | 645 |     |     |     |     | 650 |     |     |     |     |     | 655 |     |      |
| gag | ctc | ctc | act | gga | gaa | att | cca | ttc | gct | cat | ctc | aag | cca | gcc | gct | 2016 |
| Glu | Leu | Leu | Thr | Gly | Glu | Ile | Pro | Phe | Ala | His | Leu | Lys | Pro | Ala | Ala |      |
|     |     |     | 660 |     |     |     | 665 |     |     |     |     |     | 670 |     |     |      |
| gca | gca | gca | gat | atg | gcg | tat | cac | cac | atc | aga | ccg | ccc | atc | ggc | tat | 2064 |
| Ala | Ala | Ala | Asp | Met | Ala | Tyr | His | His | Ile | Arg | Pro | Pro | Ile | Gly | Tyr |      |
|     |     | 675 |     |     |     |     | 680 |     |     |     |     | 685 |     |     |     |      |
| tcc | atc | ccc | aag | ccc | atc | tca | tcc | ctg | ctg | ata | cgg | ggc | tgg | aat | gca | 2112 |
| Ser | Ile | Pro | Lys | Pro | Ile | Ser | Ser | Leu | Leu | Ile | Arg | Gly | Trp | Asn | Ala |      |
|     | 690 |     |     |     |     | 695 |     |     |     |     | 700 |     |     |     |     |      |
| tgt | cct | gaa | gga | cga | cca | gag | ttc | tct | gaa | gtc | gtt | agc | aaa | ctg | gag | 2160 |
| Cys | Pro | Glu | Gly | Arg | Pro | Glu | Phe | Ser | Glu | Val | Val | Ser | Lys | Leu | Glu |      |
| 705 |     |     |     |     | 710 |     |     |     | 715 |     |     |     |     | 720 |     |      |
| gag | tgc | cta | tgc | aat | gtg | gag | ctc | atg | tct | cca | gca | tca | agt | aac | agc | 2208 |
| Glu | Cys | Leu | Cys | Asn | Val | Glu | Leu | Met | Ser | Pro | Ala | Ser | Ser | Asn | Ser |      |
|     |     |     | 725 |     |     |     |     | 730 |     |     |     |     |     | 735 |     |      |
| agt | ggc | tct | ctg | tca | cct | tcc | tct | tct | tcc | gat | tgc | ctg | ctg | agc | cgg | 2256 |
| Ser | Gly | Ser | Leu | Ser | Pro | Ser | Ser | Ser | Ser | Asp | Cys | Leu | Leu | Ser | Arg |      |
|     |     |     | 740 |     |     |     | 745 |     |     |     |     |     | 750 |     |     |      |
| gga | ggg | cct | ggc | cgg | agc | cac | gtg | gca | gcc | tta | cgg | agc | cgt | ttt | gag | 2304 |
| Gly | Gly | Pro | Gly | Arg | Ser | His | Val | Ala | Ala | Leu | Arg | Ser | Arg | Phe | Glu |      |
|     |     | 755 |     |     |     |     | 760 |     |     |     |     | 765 |     |     |     |      |
| ttg | gag | tat | gcc | cta | aat | gca | agg | tcc | tat | gct | ggg | tgg | tcc | caa | agt | 2352 |
| Leu | Glu | Tyr | Ala | Leu | Asn | Ala | Arg | Ser | Tyr | Ala | Gly | Trp | Ser | Gln | Ser |      |
|     | 770 |     |     |     |     | 775 |     |     |     | 780 |     |     |     |     |     |      |
| gtt | gga | aca | cac | tct | aat | ccg | ggc | ctg | tct | ttg | gag | gag | atg | aat | agg | 2400 |
| Val | Gly | Thr | His | Ser | Asn | Pro | Gly | Leu | Ser | Leu | Glu | Glu | Met | Asn | Arg |      |

|   |      |     |  |     |  |     |  |
|---|------|-----|--|-----|--|-----|--|
| 785   |      | 790 |  | 795 |  | 800 |  |
| agc acc cag tat tca act gtt gac aaa tac ggc tat gtg tct gat ccc | 2448 |     |  |     |  |     |  |
| Ser Thr Gln Tyr Ser Thr Val Asp Lys Tyr Gly Tyr Val Ser Asp Pro |      |     |  |     |  |     |  |
|   |      | 805 |  | 810 |  | 815 |  |
| atg agc ctg acg cac ctt cac tcc cgc caa gac gac agc aac ttt gag | 2496 |     |  |     |  |     |  |
| Met Ser Leu Thr His Leu His Ser Arg Gln Asp Asp Ser Asn Phe Glu |      |     |  |     |  |     |  |
|   |      | 820 |  | 825 |  | 830 |  |
| gac agc aac   | 2505 |     |  |     |  |     |  |
| Asp Ser Asn   |      |     |  |     |  |     |  |
|   |      | 835 |  |     |  |     |  |